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ABSTRACT

In a longitudinal study of the network characteristics that assist elderly individuals to meet their needs, as well as the effects of change in four categories of social network dimensions (social interaction, network structure, member attribute, environmental attribute), 133 elderly residents of 18 midtown Manhattan single room occupancy (SRO) hotels were interviewed twice over a 1-year period. The subjects were 58 men, 75 women and 93 percent white. Physical and mental health and social functioning were assessed through the Comprehensive Assessment and Referral Evaluation. Social interaction data were obtained from the Network Analysis Profile. An analysis of the results showed that although all groups met at least four-fifths of their total needs, those in poor health (PH) or undergoing more stress (HS) had more difficulty in meeting their needs than their low stressed (LS) and healthier (GH) counterparts. For the former groups, inability to meet needs at the first interview was significantly related to failure to meet needs at the second interview. Social networks contributed substantially to explaining ability to meet needs among those in the PH/HS group, with interactional, structural, and environmental attributes showing substantial increases in variance. For the GH/LS groups, significant increments in variance occurred primarily within the interactional sphere. The findings confirm the direct, buffering and non-linear effects of social networks. (BL)

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SOCIAL NETWORKS AND ADAPTATION

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SOCIAL NETWORKS AND ADAPTATION

Abstract

Previous research examining the relationship between social networks and adaptation has been limited by rudimentary measures of social interaction and the lack of longitudinal data. Utilizing 19 network variables, the authors followed 133 elderly residents of mid-Manhattan hotels for one year. The findings confirmed the direct and buffering effects of social networks. Of clinical relevance was the non-linearity of the network effect -- depending on a person's stress level different network dimensions must be emphasized and strengthened.

One of the key themes of gerontological research and practice concerns the ability of individuals to adapt to a particular environment. Specifically, are they able to meet the spectrum of needs that enables a person to survive in a particular environment. Health status, level of stress, and social networks have been identified as primary factors in affecting whether individuals will adapt to a particular setting (Lawton, 1977). Moreover, social networks have been viewed as an important mediating variable between stress and various measures such as physical health, psychological well-being, adaptation, and mortality outcome (Berkman & Syme, 197[illegible]; Cassel, 1976; Cobb, 1976; La Rocco et al., 1980). That is, social networks can buffer against the otherwise untoward effects of poor health or high stress.

An attractive feature of this relationship between social networks and adaptation is its potential therapeutic implications. For example, are there specific types of social network patterns that are especially useful in facilitating adaptation? Conversely, are there social network structures that render an individual more at-risk? Identification of such structures could greatly assist clinicians in planning network intervention strategies for high-risk individuals. Although it is essential that efforts continue to be made to eliminate those factors that diminish health and increase stress, as an immediate practical strategy it may be more expedient to intervene at the social network level. As Cassel (1976) suggested, "It would seem more immediately feasible to attempt to improve and strengthen social supports rather than reduce the exposure to the stressors" (p. 121).

However, our knowledge concerning avenues for effective interventions has been hampered by two important limitations of previous research. First, has been lack of precision in defining social networks (DiMatteo & Hays, 1981; Gottlieb, 1981; Mitchell & Trickett, 1980). For example, problems arise as to

which qualities of relations are relevant (e.g. information, affective support, number of ties, etc.). Generally, researchers have selected one or two variables such as "intimacy", 'frequency of contact" or "number of friends" as the overall indicator of social networks. Such narrow and rudimentary measures constrict our ability to delineate the precise mechanism of how social networks promote adaptation.

A second shortcoming of previous research has been that nearly all existing studies have employed a retrospective design in which both network and outcome measures have been gathered simultaneously (Dean & Lin, 1977). This approach has serious drawbacks because one cannot confidently eliminate alternative explanations of the network/adaptation relationship (Monroe, 1983). For instance, reporting of social networks may be confounded by current problems in individuals' ability to meet their needs. Furthermore, retrospective procedures involve a relative lack of control over antecedent adaptability problems. For a variety of outcome measures (e.g. health, psychological well-being) it has been shown that initial levels are the best predictors of follow-up levels. Yet, if social networks are to be considered an independent predictor of adaptability, it should be significantly associated with subsequent levels of adaptability, when the initial levels of adaptability have been controlled.

The aim of this paper is to address those deficiencies outlined above by (1) examining four categories of network dimensions which comprise a total of 19 network variables; and by (2) utilizing longitudinal data so that antecedent variables can be adequately controlled. Operationally, this involves two major research questions and analyses.

Analysis I Are some network characteristics better than others in assisting individuals to meet their needs? Operationally, controlling for needs at Time 1, are there any network dimensions at Time 1 that will significantly

predict whether persons can meet their needs at Time 2?

Analysis II What is the dynamic relationship between network change and ability to adapt? Operationally, controlling for needs at Time 1, are there any changes in network dimensions that will significantly predict a person's ability to meet needs at Time 2?

Because the literature has indicated that the major effects of social networks are manifested in times of stress and ill health (Eckenrode & Gore, 1981; DiMatteo & Hays, 1981) both analyses have been conducted to reflect these conditions.

Methods

Using a single-stage clustering technique (Van Dalen, 1973), 18 hotels were randomly selected from a universe of 22 single-room occupancy (SRO) hotels in a midtown section of Manhattan. Within the selected hotel an effort was made to interview all residents aged 60 and over on a roster furnished by the management. The initial sample (Time 1) consisted of 161 residents which represented slightly greater than 20% of the elderly population within the sampling universe of 22 hotels. On one-year follow-up (Time 2) 133 individuals were interviewed. The final sample consisted of 58 men and 75 women; 93% were white and their mean age was 72.3 years.

Older adults are excellent subjects for studying the relationships between social factors, disease, stress, and adaptation. Blazer (1982) enumerates three important reasons for using an elderly sample. First, by limiting the age range to that of older subjects one can simultaneously control for the effect of aging and, to some extent, cohort effects. Second, certain social events which are both stressful and deplete the social environment are prevalent in late life. Third, the aged may be more susceptible to the deleterious effects of the social environment, e.g. diminishment of perceptual and other adaptive capacities may

render them especially susceptible to social influences.

The choice of an elderly sample comprised of SRO inhabitants might seem peculiar. However, recent research has shown how important the social support system, albeit small, is for the aging SRO resident's survival in the community (Cohen & Sokolovsky, 1980; Erickson & Eckert, 1977). More commonly than their more affluent age peers, SRO dwellers must depend on their social networks for material as well as emotional support (Cohen & Rajowski, 1982). Although there are some loners among the SRO elderly, the notion that these hotels are comprised of isolates has been shown to be a myth (Cohen & Sokolovsky, 1980). In the present sample, the mean network size was 11.4 contacts, with only 1% of the sample reporting no contacts. Nine-tenths of all linkages involved two or more types of transactions (e.g. food exchange, advice-giving, money lending). Moreover, these individuals were not adverse to enlisting network members. For example, 76%, 81%, 92%, and 93% expressed a willingness to contact others if they had problems with cash, food, illness, or required information, respectively.

Finally, the SRO population is an at-risk group. The present sample exhibited significantly more physical and psychiatric systems than a general sample of elderly living in New York City (Cohen, in press). Moreover, the nature of the hotel setting with its decaying walls and its cross-section of mental, physical, and social pathology place the elderly resident under considerable stress. Therefore, the ability of social networks to cushion against adverse conditions can be more easily tested. Learning how social networks help this population meet their needs can serve as a model for interventions with other high-risk elderly groups.

With respect to the research instruments, physical and mental health and social functioning were determined by the Comprehensive Assessment and Referral Evaluation (CARE) developed by Gurland and his associates (Gurland et al., 1977-78). Internal consistency reliability was high for most scales. The alphas

ranged from .51-.92 except for service utilization which was .28. The inter-rater reliability for all scales, except for two whose coefficients were not able to be estimated, ranged from .56 to 1.0. Measures of social interaction were obtained from the Network Analysis Profile (NAP), which was developed in our previous work with inner-city populations (Sokolovsky & Cohen, 1981). The interrator reliability ranged from .83 to .92 on various subsections of the profile.

The NAP comprised six fields of interaction: ego-hotel contact, ego-outside nonkin, ego-kin, ego-hotel staff, ego-agency staff, and ego-social institution. Although the totality of the profile encompasses the respondent's overall "activity field," the present analysis excluded the ego-social institution field. Only those linkages with a minimal frequency of once every 3 months for hotel contacts and once a year for non-hotel contacts were included.

Numerous criteria have been employed to examine the multifaceted aspects of social networks (Barnes, 1954; Boissevain, 1974; Mitchell, 1969). For use here, we have identified four dimensions of social interaction which are comprised of 19 variables:

Predictor Network Variables

A. Interactional Data Set

1. Numplex - mean number of transactions (e.g. food exchange, advice-giving, etc.) per linkage in respondent's network.
2. Sustenance - mean number of money, food, or medical exchanges to respondent per linkage.
3. Very Important - The total number of linkages rated "very important" or "most important."
4. Frequency - mean frequency of contact per linkage.
5. Directionality - Direction in which aid in a dyadic relationship flows. Mean directionality was calculated for the

respondent's informal network.

6. Multiplex - Total number of linkages that have more than one type of transaction with respondent.

B. Structural Data Set

1. Size - Total number of linkages in respondent's network.
2. Density - Ratio of actual linkages to potential ones, excluding links with respondent.
3. Degree - The average number of linkages each person has with others in the same network, excluding linkages with respondent.
4. Configuration - Graphic measure of network interconnectivity.
5. Number of Clusters - Number of subunits in network with 100% density.
6. Large Clusters - Number of clusters with five or more members.

C. Member Attribute Data Set

1. Length of Linkage - Mean number of years linkages have known the respondent.
2. Geographic Density - Percent of respondent's network members in the hotel sector (informal or formal).
3. Gender Homogeneity - Percent of network members being of the same sex as the respondent.
4. Age Homogeneity - Percent of network members being 60 years or older.

D. Environmental Attribute Data Set

1. Age Density - Percent of persons in hotel aged 60 and over.
2. Welfare Hotel - Dichotomous variable based on whether hotel is considered a public assistance hotel or not.
3. Hotel Size - Number of rooms in the hotel.

Factor analysis of the 19 network variables revealed that, in general, these parameters were statistically independent. Only seven of the variables loaded together (numplex, very important, directfonality, number of clusters, size, multiplex, large clusters) with an alpha of .76. Although we employed a scale with these seven variables to reduce the number of dependent variables in a procedure to substantiate the findings reported here (see below), we did not use the scale in the main analyses since it has not been cross-validated. Rather, we maintained the variables within the separate data sets in accord with the theoretical conceptions described previously in the literature.

Network Change Variables

A. Interactional Data Set: A representative number of interactional variables were created based on subtracting scores at Time 1 from those at Time 2. The following variables were used:

   1. Numplex
   2. Sustenance
   3. Very Important
   4. Frequency
   5. Directionality

B. Structural Data Set

   1. Number of contacts lost in past year.
   2. Number of new contacts in past year.
   3. Compensatory contacts - whether there was at least one new contact to replace lost contacts over past year.

Other variables used in the analysis were derived from the CARE. They were:

Needs: A 40-item scale based on Lawton's taxonomy of needs list (Lawton, 1970). The scale comprises six major areas: physical health needs, mental

health needs, physical self-maintenance, instrumental self-maintenance (e.g. finance, transportation), effectance (recreation, creativity), and social needs. The higher the score, the fewer needs are being met.

Physical Health Symptoms: Sum of a respondent's z-scores on 11 health scales derived from the CARE administered at Time 1. These scales are Somatic Symptoms, Heart Disorder, Edema, Sleep Disorder, Arthritis, Stroke, Respiratory Problems, Hypertension, Cancer, Hearing Problems, and Visual Disorders. Poor health was defined as summed z-scores below the 33rd percentile. This cut-off was based on Gurland and associates' finding that one-third of New York City's elderly had at least minimal physical impairment (Gurland et al., 1981).

Stress: A 15-item scale based on categories from Dohrenwend's life events list (Dohrenwend et al., 1978). Events had to occur over the one-year follow-up period. Typical items included "deterioration in the neighborhood," "family illness," "mugging in past year," "personal injury due to crime," and "financial problems." Items which were redundant with social network variables were removed. High stress was defined as those mean scores of 0.5 standard deviations above the sample mean.

A hierarchial regression analysis with Needs Time 2 as the dependent variable was used in which data sets were entered in the following order for Analysis I: Needs Time 1, Interactional Data Set, Structural Data Set, Member Attribute Data Set, Environmental Attribute Data Set. For Analysis II the order was: Needs Time 1, Interactional Change Data Set, Structural Change Data Set.

Findings

Although all groups met at least four-fifths of their total needs, those in poor health (PH Group) or undergoing more stress (HS Group) had more difficulty in meeting their needs than their low-stressed (LS Group) and healthier (GH Group) counterparts. (Table I). For the former groups, inability to meet

needs at Time 1 was significantly related to failure to meet needs at Time 2, whereas for the latter group this relationship did not obtain (Table 2). This suggests that problems with meeting needs were more longstanding and more deep-seated for those with poor health and high stress, whereas for the healthy and low stress groups the inability to meet certain needs was more transient and without much significance.

Analysis I

After controlling for needs at Time 1, the percent of variance accounted for by the social network variables was appreciable for all four groups (Table 2). However, only among the LS group did the increment in variance attain statistical significance. For the PH/HS groups, the smaller sample size accounted for the failure to attain statistical levels of significance.

Importantly, social networks contributed substantially more to explaining ability to meet needs among those in the PH/HS groups than those in the GH/LS groups. Moreover, among those in the PH/HS groups, three of the four data sets -- interactional, structural, environmental network attributes -- showed substantial increases in variance, although none of these increases attained statistical significance. For the GH/LS groups, significant increments in variance occurred primarily within the interactive sphere.

Although the variables as a set produced interesting findings, only a handful of individual variables attained statistical significance. For the PH, GH, and LS groups, the type of hotel was predictive of ability to meet needs. Being in a hotel with more residents on public assistance enhanced a person's chances of meeting his or her needs. Despite the difficulties of these environments, they may provide some subtle benefits as indicated by the fact that the variable was associated with more provision of sustenance items ($r = .13$) and more frequent social interactions ($r = .17$). Consonant with the

work of Rosenberg (1968), the greater homogeneity of socioeconomic status within the poorer hotels may have served to enhance social interaction. Finally, for the GH/LS groups, individuals with network configurations which were high density among kin but low density among nonkin were less successful in meeting needs. This indicated that nonkin may have to act in concert to provide adequate support to needy individuals.

Because of the low number of respondents (n=33) in the high stress group and relatively large number of variables entered into the regression equation (20), we performed a second regression analysis using the scale comprised of seven network variables along with the other network variables and the needs variable at Time 1. Hence the number of variables entered into the equation was reduced to fourteen. The percentage of variance contributed by the network variables to explaining the ability to meet needs at Time 1 was 42% and 25% for the HS and LS groups, respectively. Although there was some diminution in the percentages of explained variance from the original analysis, the data still strongly confirmed the initial findings.

Analysis II

A similar pattern as was found in Analysis I emerged with respect to network changes and the ability to meet various needs (Table 3). Here again, substantial network changes occurred in both the interactional and structural data sets within the PH/LS groups, whereas among the GH/LS groups only changes in the interactional sphere explained ability to meet needs. However, the amount of total variance accounted for by the network variables did not differ as dramatically between the GH/LS and the PH/HS groups.

Once again the data sets produced more interesting findings than the specific variables. Nonetheless, a few individual variables emerged as significant. Changes in the frequency of interaction was statistically significant

for the HS, GH, and LS groups. That is, decreases in frequency of interaction over the one-year follow-up period was associated with inability to meet needs, and conversely increases in the frequency of interaction was helpful in meeting needs. Among the GH/LS groups, another interactional variable, changes in the number of very important contacts, was found to be significant. Since this variable is highly associated with more affective exchanges such as intimacy (Cohen & Rajkowski, 1982), it suggests that for the GH/LS groups having contacts that meet their non-material needs may be more consequential. That is, the quality and frequency of the relationship appears to be paramount. On the other hand, for the PH/HS groups, two variables related to the quantity of contacts emerged as significant: loss of contacts and the ability to compensate for loss. This indicated that for PH/HS groups it is the frequency and quantity of contacts that are crucial in meeting needs. Moreover, the material nature of relationships seemingly takes precedent over the affective components.

Discussion

As a prologue to the discussion it should be underscored that the data are derived from a study of an inner-city elderly population. Consequently, the generalizability of the findings to other populations must be approached with appropriate caution. With this in mind, we have focused the discussion on the findings concerning the larger data sets rather than specific variables, since the former are more likely to have broader implications. A second caveat concerns the relatively small size of the HS group. Although we corroborated our findings by performing a second analysis with a reduced number of variables in the analysis, it is likely that the results would have been somewhat attenuated had a larger sample been used.

The study was successfully able to address a number of key issues that heretofore have remained unresolved. A vast majority of previous studies have used retrospective data. Even when they used prospective data, they frequently

failed to control for the dependent variable at Time 1 (Monroe, 1982). As a result, although significant relationships between social networks and dependent variables were commonly found, it was difficult to determine causality or whether the effects were spurious since there may have been a large degree of shared variance occurring between social supports and the prior levels of the dependent variables.

In the present study, by controlling for needs at Time 1 and using a prospective design, we were able to demonstrate that social networks do indeed exert an independent influence on an individual's ability to meet his or her subsequent needs. Percent variance explained by the social networks variables alone at Time 1 ranged from 27% to 52% depending upon the group studied.

Moreover, the use of network variables which measured changes in the support system between Time 1 and Time 2 was able to explain between 17% to 31% of the variance depending upon the group studied. Rather than a static picture of network based on Time 1 data we were able to depict a dynamic picture of networks which further confirmed the independent and antecedent relationship between social networks and subsequent ability to meet needs.

A second issue that has been debated in the literature is whether social networks have a direct effect on outcome variables or whether it is predominantly a buffering effect (LaRocco et al., 1980). That is, does support contribute directly to meeting needs or does it cushion or protect the individual from deleterious effects of additional stressors? In part, this controversy may reflect the multifarious variables that have been used as measures of social support across studies. In most instances one or two variables have been used in a single study, e.g. friendship, emotional support (DiMatteo & Hays, 1981). In the present study a total of 19 network variables were used so as to elicit substantially more facets of social interaction. In dividing the sample by health and stressor level we were able to determine whether network effects are primarily direct or buffering. In so doing, the direct effects could be assessed by

measuring the percent variance explained by networks under normal or low stress conditions. The buffering effects could be determined by examining the differences in the percent variance explained by networks under high and low stress conditions.

The data supported both views. Networks had a direct effect in that percent variance explained by Time 1 network variables for groups with good health and low stress was 30% and 27%, respectively. However, the amount of explained variance was considerably higher for those in poor health and undergoing high stress were 45% and 52%, respectively. Although networks have a direct effect on ability to meet needs their importance dramatically increases for those individuals in unfavorable circumstances. With respect to the network change variables, the direct effect was similarly present, but the buffering only appeared with regard to stress, not health.

A final consideration concerns whether the buffering effects of social supports work linearly or whether there is a more extensive reorganization of the network system. In part, semantic problems have contributed to the notion of linearity. Weinberg and Marlowe (1983) observe that there has been a tendency to confuse the concepts of social supports and social networks. Social support is viewed as exchanges between individuals which must be perceived as <u>beneficial</u> to the recipient. Therefore, more is usually better. Social networks is a broader category that encompasses social support, but it includes a variety of measures of social interaction that do not necessarily imply benefits to the recipient, e.g. density, configuration, geographic density, directionality. Certain types of network dimensions may be better, but the notion of linearity is inappropriate. Here again, previous research has been limited in this regard because of the paucity and type of network variables that were employed, e.g. frequency of interaction, number of friends. Consequently, if a significant effect was found it was assumed that the network variable acted on the outcome measure through accretion (i.e. more is better).

Extrapolating from the data derived here, it is easy to imagine why earlier investigators posited linear relationships. For example, several of the significant change variables -- frequency of interaction (GH/LS groups), subjective importance (GH/LS groups) and network size (PH/HS groups) -- are precisely those kind of linear variables that were traditionally found to be important in the literature.

The use of a large number of network variables enabled us to undercover more complex processes than had been previously depicted. In the GH/LS groups success at meeting needs was best explained by the Interactional Data Set. It is interesting to speculate that for those individuals who are meeting most of their needs under relatively favorable conditions the more qualitative, affective needs become more important, and those corresponding aspects of the social network system are enlisted.

On the other hand, for those individuals in poor health or undergoing high stress, material as well as emotional needs become more difficult to obtain. Those individuals who are more successful at adaptation showed an ability to enlist both interactional and structural aspects of their networks. Moreover, the environmental network structures become increasingly relevant in that they can facilitate social interaction. The obverse of this formulation is that members of the PH/HS groups exhibit much more sensitivity to network losses. It is the availability of others to provide support (generally material aid) that is essential for adaptation. Hence it is necessary to reconsider the notion that the buffering effects of social networks act in a linear fashion.

Our findings confirm the clinical wisdom that various aspects of social networks are important to everyone, and that they assume even greater significance in times of stress. However, our data suggest a disjunction between those in high and low stress groups in that different network dimensions take on importance for those individuals experiencing high stress. Those network features that were adaptive for persons undergoing low stress generally were not as singularly

important for those experiencing high stress. For clinicians, it would be especially useful to know if the network patterns found among the better adapters in the HS and PH groups represented a network response to moving from a low stress or good health situation to a high stress or poor health one. Or was it serendipitous for these individuals to have networks that augmented their ability to meet needs? Unfortunately, since we had no antecedent variables for life events or for health at Time 1 we could not definitively answer this question. However, in looking at the network change variables with respect to stressful events over the 12 month period, there was an indication that alterations in the structural network dimensions -- ability to maintain network size -- might represent an adaptive response of going from a low stress or good health situation to a high stress or poor health one, and thereby suggesting a point for therapeutic intervention.

Clinicians working with network systems face a more complex challenge than was previously supposed. Depending on their client's stress level, different network dimensions must be emphasized and strengthened. For the population examined here, structural dimensions assume additional importance for those undergoing greater stress. Although different dimensions may assume importance in other populations, we believe that it is likely that disparities in the relative values of particular network dimensions depending upon stress level will be generalizable across samples.

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Table 1 Percent Needs Met by Group

	Poor Health (PH) N=43	Good Health (GH) N=90	High Stress (HS) N=33	Low Stress (LS) N=100
Time 1	85%	91%	82%	91%
Time 2	86%	89%	85%	89%

Table 2 Predictor Variables: Increment in Explained Variance (R^2) of Needs at Time 2[a]

	Poor Health (PH) N=43	Good Health (GH) N=90	High Stress (HS) N=33	Low Stress (LS) N=100
Needs (Time 1)	.17[c]	.01	.22[c]	.01
Interactional Data Set (Time 1)	.13	.16[b]	.11	.11
Structural Data Set (Time 1)	.18	.03	.18	.05
Member Attribute Data Set (Time 1)	.05	.06	.04	.03
Environmental Attribute Data Set (Time 1)	.09	.05	.19	.08[b]
Total Variance Explained by Networks Sets	.45	.30	.52	.27[c]

(a) Hierarchical regression analysis
(b) $P < .05$
(c) $P < .01$

Table 3 Change Variables: Increment in Explained Variance (R^2) of Needs at Time 2[a]

	Poor Health (PH) N=43	Good Health (GH) N=90	High Stress (HS) N=33	Low Stress (LS) N=100
Needs (Time 1)	.17[c]	.01	.22[c]	.01
Interactional Data Set (Time 2 minus Time 1)	.08	.20[c]	.21	.15[c]
Structural Data Set (Time 2 minus Time 1)	.11	.03	.10	.02
Total Variance Explained by Network Change Set	.19	.23[b]	.31	.17[b]

(a) Hierarchical regression analysis
(b) $P < .05$
(c) $P < .01$